

Review of the Human Health and Screening Level Ecological Risk Assessment Reports for the Eagle Zinc Company Site

TO: Dion Novak/USEPA Region 5

FROM: John Lowe/CH2M HILL
Ryan Loveridge/CH2M HILL
Steve Petron/CH2M HILL
Chris English/CH2M HILL

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EPA Region 5 Records Ctr.



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CH2M HILL has reviewed the Human Health Risk Assessment (HHRA) and Screening Level Ecological Risk Assessment (SLERA) Reports for the Eagle Zinc Company Site (the Site) in Hillsboro, Illinois. The HHRA and SLERA Reports were submitted by ENVIRON on March 15 and 17, 2004, respectively. Our technical comments on each document are provided below.

Background

The HHRA and SLERA Reports were submitted to USEPA Region 5 after several months of correspondence between USEPA and ENVIRON. On November 3, 2003, ENVIRON submitted a deliverable laying out a proposed approach for human health and ecological risk assessments for the Site. USEPA provided comments on the deliverable in a letter dated December 30, 2003, and ENVIRON responded to those comments in a January 26, 2004 letter to USEPA. CH2M HILL commented on ENVIRON's responses in a technical memorandum to USEPA on February 4, 2004. Representatives from USEPA, ENVIRON, and CH2M HILL met at USEPA Region 5 Headquarters to discuss the risk assessments, primarily the HHRA, on February 18, 2004. To assess the presence of habitat and ecological receptors at the Site, representatives from CH2M HILL, ENVIRON, and Limno-Tech (ENVIRON's ecological risk assessment subcontractor) conducted a Site visit on March 3, 2004. CH2M HILL submitted a technical memorandum and photographs from the Site visit to USEPA on March 9 and 15, 2004, respectively.

Throughout the process described above, USEPA consistently maintained that the following elements should be included in the HHRA and ERA Reports:

- Consideration of possible future residential development of the Site
- An evaluation of human health risks to future on-Site residents.
- Information in the SLERA to support the assumption that physical impacts are indistinguishable from chemical impacts

- An evaluation of terrestrial receptors in the SLERA, or evidence that such receptors are not present at the Site

With the exception of the third bullet listed above, these elements were not adequately addressed in either the HHRA or SLERA Reports. The SLERA Report did not take the position that physical and chemical impacts at the Site are indistinguishable.

Human Health Risk Assessment Report

General Comments

The analysis provided in the HHRA is not adequate to support the conclusion that the site poses no risks that warrant further evaluation of remedial alternatives. As it is written, the HHRA is not adequate to support an evaluation of remedial alternatives, including the no-action alternatives, in the FS. Specific suggestions have been offered to attempt to make the analysis in the HHRA adequate for the needs of the remedial response process. Primary concerns with the document are as follows:

- An on-Site residential exposure scenario has not been included in the HHRA. In previous correspondence, inclusion of an on-Site residential scenario was specifically requested in the HHRA.
- The document includes a justification for not calculating risks for an on-Site residential scenario based on Superfund Ready for Reuse (RfR) guidance. In the February 18, 2004 meeting, it was requested that the RfR guidance not be cited in the HHRA.
- Concentrations of lead and cadmium are elevated in a few off-Site sediment concentrations. However, the HHRA does not calculate risks to off-Site residents associated with these concentrations.
- Exposure point concentrations (referred to as "representative concentrations" by the authors) in soil appear to be averaged across the entire Site, which could result in the HHRA missing risks in potential hot-spot areas. Not all of the sampled media (particularly historical sampling of the residue piles) have been included in the risk assessment, potentially resulting in risks being understated.
- The analysis of potential inhalation exposures and risks does not appropriately represent Site conditions. An expanded air pathway analysis may be required to assure that risks from dust emissions both on- and off-Site are properly addressed. Screening levels based on inhalation exposure pathways will need to be recalculated to incorporate the results from the revised air pathway analysis. In addition, the HHRA does not include the off-Site garden exposure scenario requested in previous correspondence.
- Some of the screening levels have been calculated using inappropriate toxicity values, and will need to be recalculated.
- Documentation of the portions of the HHRA methodology is not adequate to verify that those portions were implemented correctly.

- Minor editorial glitches were encountered throughout the text and tables. For the large part, the comments do not identify these; however the document should be reviewed by an editor before being resubmitted.

Specific Comments

1. **Page ES-1, Paragraph 3:** Delete the last sentence making reference to the Superfund RfR guidance. This statement would be appropriate in the Feasibility Study. It is not appropriate in the HHRA.
2. **Page ES-2, Paragraph 1, bulleted list of exposure scenarios evaluated:** The list of exposure scenarios does not include the On-Site Resident. In previous correspondence and in the February 18, 2004 meeting, it had been requested that the HHRA include calculation of risks for the On-Site Resident scenario.
3. **Page ES-3, Paragraph 1:** The stated risk assessment approach involves calculation of risk-based screening levels associated with specific exposure pathways and exposure factors. To account for cumulative exposures and risks, the screening levels and exposure point concentrations are used to calculate ratios that represent total pathway risk from multiple chemicals. It is stated that total risk/hazards are calculated in each exposure media, and are summed across all media to obtain a cumulative risk estimate for each scenario. This appears to address previously raised concerns that the HHRA provides cumulative risk estimates, even though this approach is substantially different, both conceptually and computationally from USEPA's *Risk Assessment Guidance for Superfund, Part A*. Please incorporate into the HHRA reference to USEPA's Region 9 PRG documentation, which incorporates a procedure for calculating cumulative risk estimates using risk-based screening levels.
4. **Page ES-3, Paragraph 1:** The authors of the HHRA have chosen to call the quantitative estimates of health risks "screening level cancer risks" and "screening level hazard indices". However, the authors do not: 1) identify where these represent terminology derived from risk assessment guidance, or 2) state the outcome of a screening level analysis, which is to propose a more detailed and refined risk assessment, if needed based on the screening level results. In order to make this document useful for decision makers, the authors should focus on more transparently characterizing the uncertainties and conservatism in the numerical risk estimates rather than dismissing those estimates as "screening level", implying that they are significantly exaggerated in some unstated fashion. Please delete references to "screening level cancer risks (SLCRs)" and "screening level hazard quotients (SLHQ)" throughout the document.
5. **Page ES-3, Paragraph 2:** Please reword the third sentence (starting with "Because the area of affected sediment. . .") as follows: *"... by occasional contact with sediment, the finding that individual sample results exceed a residential screening level for lead does not necessarily indicate that there is an elevated risk associated with lead in sediment."* Risks to off-Site residents from lead and cadmium in sediments need to be calculated and incorporated into the HHRA.
6. **Page ES-3, Paragraph 4:** Please delete the words "significantly exaggerate" and replace with the word "overstate". In reviewing the conclusions, it is noted that the authors of

the HHRA did not include the on-Site resident scenario as a future land use scenario. A request had been made to include this scenario in the HHRA.

7. **Page 1, Paragraph 3, 1st bullet:** The first objective of the HHRA is stated as to provide an analysis of potential risks assuming no remedial action or institutional control. USEPA notes that consideration of an on-Site resident scenario in the HHRA is consistent with this objective.
8. **Page 1, Paragraph 4 (to the top of Page 2):** Please delete this paragraph referring to the Guidance for Preparing Superfund RfR Determination. This information is more appropriately presented in a Feasibility Study because it addresses identification of a potential remedial technology (implementation of institutional controls), and therefore should appear elsewhere than in the HHRA.
9. **Page 4, Section D:** We note that this approach to characterizing risks, which involves comparison of representative media concentrations to target levels, deviates from the *Risk Assessment Guidance for Superfund* documents used for preparation of a baseline risk assessment.
10. **Table 1:** Exposure pathways for an on-Site resident scenario are judged to be incomplete. While this is correct under current land use, it is not appropriate for purposes of the HHRA to categorically rule out an on-Site residential scenario under future land use. Please add information to this table noting that exposure pathways are potentially complete to an on-Site resident under future land use conditions. Exposure pathways from soil for an off-Site resident cannot be deemed incomplete without more detailed justification. Please include an exposure pathway from ingestion of garden-raised fruits and vegetables for the off-Site resident.
11. **Page 5, Paragraph 1:** Please delete the last sentence of the paragraph. It is not needed for the risk assessment to be useable for decision makers.
12. **Page 5, Paragraph 2:** Please delete this paragraph. It does not correctly depict how the results of the risk assessment will be used to support Site decision-making. It is anticipated that cumulative risk estimates, aggregated across all exposure pathways and chemicals, for each scenario will be compared with the guidance provided in the *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions*, OSWER Directive 9355.0-30, April 22, 1991. Please delete Figure 3 from the document, because it also does not correctly depict how the results of the risk assessment will be used to support Site decision-making.
13. **Page 8, 1st full paragraph:** Please delete the next to last sentence in the paragraph (which starts "As such, it suggests the applicability. . ."). Please reword the last sentence in the paragraph (which starts "Therefore, this HHRA is based on. . .") as follows:
Therefore, this HHRA includes a commercial/industrial land scenario based on the assumption that future land use at the Site will remain commercial/industrial.
14. **Table 2:** Correct the units on the tap water action levels from mg/L to ug/L.
15. **Page 9, Paragraph 1:** This sentence states, "Screening levels for selection of COPCs in soil and sediment are defined as the lower of Illinois background levels and EPA Region 3's Risk-Based Concentrations (RBCs)". It seems that the sentence should read, "...

defined as the *higher* of Illinois background levels and EPA Region 3's Risk Based Concentrations. . ." in order to be consistent with how data were screened. In particular, the executive summary noted that arsenic concentrations were screened against the background level and not the RBCs. Please review and correct as appropriate.

16. **Page 10, Paragraph 3:** The risk assessment has not included all of the data collected from the site in identifying COPCs. In particular, the historical data from the residue sampling piles (see Table 5 of the 2002 *Preliminary Site Evaluation Report*) are not presented and evaluated in the risk assessment. Please include the historical sampling results in the preliminary site evaluation report in the COPC screening.
17. **Pages 10 and 11, Section C:** Additional information is requested to verify that the exposure point concentrations presented in Table 8 have been estimated correctly. Please provide a list of samples used to develop the average concentrations in sediment and soil. Please include the historical residue pile data provided in the *Preliminary Site Evaluation Report* (see Table 5 of that report), and characterize potential risks associated with contact with the residue piles as separate exposure units. Please provide a description of the size of the exposure units in soil and sediment represented by the average concentrations. Note that in the Phase I Technical Memorandum, *Remedial Investigation Phase I: Source Characterization*, onsite media (soils) are divided into several investigation areas (see Figure IV-3), which should be regarded as exposure units. Please calculate exposure point concentrations for each of these areas for purposes of characterizing health risks. Please describe the statistical methods used to test the distributions before calculation of the UCLs. For each contaminant and media, please note if the exposure point concentration is based on a distribution (i.e., UCL on the average), the maximum concentration, or a concentration from a sample location within an exposure pathway. Note that USEPA has issued guidance in 2002 (*Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites*, OSWER 9285.6-10, December 2002) for calculating exposure point concentrations that may supersede the 1992 guidance cited in the HHRA.
18. **Figure 2:** Please make the following corrections to the conceptual model of exposure pathways: 1) include as a complete exposure pathway direct contact with surface soil to a resident; 2) show the "particle suspension --> air flow/wind --> surface soil" pathway as complete to an offsite resident; 3) add residue piles as an exposure media to onsite receptors.
19. **Page 13, Paragraph 3 (Section III.A.).** Description of potential contaminant source areas is not adequate for purposes of understanding how sampling and analytical data represents potential exposures to human or ecological receptors. For example, on-site soil samples appear to have been collected beneath residue layers that are apparently on the surface (see Table II-1, Soil Sampling Summary in the Phase I Technical Memorandum). Please update this section to define where soil samples have been collected. Residue pile results from sampling conducted in 1998 (presented in the *Preliminary Site Evaluation Report*) detected elevated concentrations of lead. Please include a description of the residue data to this section.
20. **Table 8:** Add exposure point concentrations in soil and sediment for child and adult residents.

21. **Table 9:** The source for the calculated PEF is listed as Equation B-8 in EPA, 2002a. The value is produced by Equation 6 on Page 27. Please provide the correct citation.
22. **Page 14, Section C (potential receptor populations):** Add Off-Site Residents (future) to the list of receptors.
23. **Page 16, last paragraph (and top of page 17):** Delete the discussion of proximity and location of off-Site deposition impacts based on prevailing wind direction (3rd, 4th and 5th sentence in the paragraph). Not detecting visible deposition in the downwind direction is not credible evidence that there is no off-Site deposition of contaminants. . The *Preliminary Site Evaluation* report states, "*the existing residue piles do not appear to be a source of airborne dust emissions. These observations include the relatively large grain size of the materials exposed at the surface of the stockpiles, the consolidated/compacted nature of the older stockpiles and no observed a airborne dust in the areas of the piles during windy conditions. Potential impacts resulting from historical emissions will be evaluated through soil investigations proposed for the RI/FS Work Plan*" (see pages 20-21). However, the investigations conducted during the RI do not appear to have addressed this pathway, and the HHRA do not provide any data to support these assertions. Please state in the HHRA conclusions that the exposure pathway from dust resuspension from the piles and deposition onto offsite soils is potentially complete, and that risks through this pathway have not been quantified. Also state that this uncertainty potentially leads to risks being understated from the residue piles. There are data gaps that preclude conducting a meaningful air pathway analysis, however, it is not proposed that the risk assessment be delayed to collect those data for an air pathway analysis. Additional data to evaluate the potential offsite air pathway can be collected as a part of the FS or during remedial design
24. **Page 19, Paragraph 2:** Were ingestion and dermal contact of Lake Hillsboro surface water considered to be complete exposure pathways and quantified in the risk assessment? Please add a statement clarifying this point.
25. **Page 19, Paragraph 3:** Insufficient justification is provided for not quantifying risks from contact with sediments in on- and off-Site surface water bodies. According to Table 4, the maximum concentration of cadmium in sediment is 550 mg/kg, and the maximum concentration of lead is 2,700 mg/kg. These values are well above screening levels, and the HHRA identified these and other metals as COPCs in sediment. Please quantify potential ingestion and dermal exposures to off-Site residents (adult and child).
26. **Page 19, Section E:** Include a statement in this section pointing the reader to Section V for the equations used in developing the screening levels.
27. **Table 15 (cadmium and manganese RfDs):** Please recalculate screening levels for cadmium in soil and sediment using the oral RfD of 0.0005 mg/kg-day. There are no data indicating that the gastrointestinal (GI) absorption of cadmium from soil is the same as the GI absorption from food. Please recalculate screening levels for manganese in soil and sediment using the oral RfD of 0.047 mg/kg-day. According to the IRIS profile for manganese, the 0.047 mg/kg-day value should be used to characterize risks from manganese in soil.

28. **Table 15 (TCE toxicity values):** The citation for the TCE toxicity values is incorrect. The values presented in the table are not recommended by NCEA. Toxicity values for TCE have been withdrawn from IRIS, and no new values are available at this time. Revised toxicity values for TCE are currently being reassessed by USEPA. The text in Section IV and Table 15 should be revised to reflect the actual status of TCE toxicity values. The values presented in Table 15 may be used for characterizing TCE risks. However, a separate calculation of TCE risks must be performed using the provisional high-end cancer slope factor and the RfD from USEPA's 2001 TCE risk assessment, and discussed as an uncertainty in Section VI of the HHRA.
29. **Table 16:** The footnotes are not presented on Table 16, so that the physical and chemical properties can be verified. Please add the footnotes to this table. Note that the BCF value for cadmium is considerably understated. Additional information needs to be provided to justify a BCF of 50 for cadmium. Also, bioconcentration of arsenic and lead into fish needs to be calculated and included in the HHRA.
30. **Page 27, Equation 6:** Calculation of a default PEF does not provide an adequate air pathway analysis of potential dust emissions from the Site, and as presented in the HHRA may substantially understate the target levels in soil for the inhalation exposure pathway. As described on page ES-1, the Site covers 132 acres, of which some fraction represents potential dust emissions sources. The inverse dispersion coefficient (Q/C) value represents a $\frac{1}{2}$ acre source area with an assumed fraction of vegetative cover of 0.5. Therefore, it is not appropriate to apply the PEF to surface areas larger than $\frac{1}{2}$ acre. Please recalculate the Q/C value so that it represents the size of the Site and the actual extent of vegetative cover. As described previously, there are data gaps that preclude conducting a meaningful air pathway analysis for the site. However, it is not recommended that the HHRA be delayed to collect the needed data. Therefore, the HHRA should include discussions of the uncertainties in the evaluation of the air pathway. Please confirm that the mean annual wind speed used in the emissions modeling reflects Site conditions. Please provide discussion in the HHRA of how the default threshold wind speed compares with the surface conditions and grain size distribution in surface soils and residue piles (for example, if the mode particle size in onsite surface materials is smaller than the default assumption, the threshold wind speed used is not conservative). Note that if the annual average wind speed and threshold wind speed are revised, then the $F(x)$ value also will need to be recalculated. Target levels in soil for the inhalation exposure pathway will need to be recalculated to incorporate the revised PEF.
31. **Section VI and Tables 17-28:** These were not reviewed. Based on the previous comments, revisions to the HHRA are required that will result in changes to the screening levels, estimated risks and characterization of risks associated with the Site. However, the tables contain several spreadsheet glitches (#NAME? error messages) that should be corrected before resubmitting the HHRA.

Screening Level Risk Assessment Report

General Comments

CH2M HILL's review of the SLERA included a quality check of the calculations, and an evaluation of the assumptions and conclusions. Although only a small number of calculation errors were found (specific errors are listed in the Specific Comments section below) and correction of these errors would have little impact on the risk conclusions, a major insufficiency was noted in the lack of assessment of on-Site terrestrial and aquatic receptors.

The reasons for this omission included the future land-use, the size, quality, and type of on-Site habitat, and the value of the on-Site ecological resources to be protected. Because the intended future land-use on-Site will be commercial/industrial, it is suggested in the SLERA that evaluation of the ecological receptors on-Site is not necessary. It is advisable to evaluate all current conditions in the SLERA, such that risks will be understood should development not occur in a timely fashion. Ready-for-Reuse (RfR) Determination (USEPA, 2004) was indicated as a key component in the development of the Site. In the RfR guidance (USEPA, 2004), RfR Determination will not occur until, *"the site meets CERCLA standards of protectiveness."* Because the current level of risk on-Site has not yet been determined and the time until development is uncertain, the CERCLA standards of protectiveness will not be met. RfR determination also does not guarantee that development will occur, therefore, adverse ecological effects, if present would continue. Furthermore, the area of development has not been presented, but if it is limited to only the former Buildings and Manufacturing Area, a large area on-Site that provides habitat to ecological receptors will not have been assessed and appropriately addressed.

Inadequacies in the size, quality, and type of on-Site habitat were also cited as a reason not to evaluate on-Site ecological receptors. The following excerpt from the SLERA summarizes the decision not to assess on-Site receptors:

(Page 23; Paragraph 4) *"... the available on-Site habitat is not of the size, quality, and type that is supportive of sustainable wildlife populations, communities, and ecosystems."*

The habitat on-Site is of a sufficient size to evaluate risk to ecological receptors from current- and future-use. As defined by USEPA (1997), habitat is a, *"Place where a plant or animal lives, often characterized by a dominant plant form and physical characteristics."* This area is partitioned into habitats in Figure 4-2 of the SLERA by the dominant plant forms (woods, mixed woods, and old field) and is connected to adjacent off-Site areas of similar habitat. Note also that the adjacent land to the north and south of the western drainageway area was described as good songbird habitat in the SLERA (Page 18; Paragraph 1). Terrestrial habitat of this size could support a terrestrial wildlife community of songbird and small mammal populations as defined by the USEPA (1992) definitions of community (*"An assemblage of populations of different species within a specified location and time"*) and population (*"An aggregate of individuals of a species within a specified location in space and time"*).

Rather than estimate the number of individuals of a species on-Site, SLERA guidance dictates conservative assumptions, as noted in the following excerpt:

"For the screening level exposure estimate for terrestrial animals, assume that the home range of one or more animals is entirely within the contaminated area, and thus the animals are exposed 100 percent of the time."

This conservative assumption captures a scenario where the Site acts as a "sink" (adverse effects, including lethality, occur in individuals exposed to on-Site contaminants) for regional populations of migratory and resident populations of birds and mammals.

The community and terrestrial habitat area should also be considered an ecosystem according to USEPA (1997) definition (*"The biotic community and abiotic environment within a specified location and time"*). According to the USEPA definitions, an aquatic ecosystem on-Site consists of community of fish, amphibians, and invertebrate populations in the southwest Pond and drainageways.

The lack of valuable ecological resources was also presented as a reason for not evaluating on-Site receptors. For example, although deer and raccoon were observed on-Site, they were described as *"often considered nuisance species"* that *"do not constitute valuable ecological resources as defined in EPA guidance (EPA, 2001)."* Note that the citation (which should be corrected to EPA, 2001a) is a discussion document and not actual USEPA SLERA guidance. However, in this discussion document "valuable" ecological resources were not defined, but game species, such as white-tailed deer, were considered of societal value. Species with societal value were also listed as a possible criterion to identify ecological entities to protect in another cited USEPA discussion document (USEPA, 1997b). This criterion was listed in the SLERA, along with "ecological significance," for which examples were not given, but would include lower trophic receptors such as invertebrates that are expected on-Site.

USEPA SLERA guidance (USEPA, 1997) has assessment endpoints as any adverse effects on ecological receptors, where receptors are plant and animal populations and communities, habitats, and sensitive environments. Subsequently, the following changes (and subsequent modifications) to the SLERA are needed:

- Assessment of effects to on-Site terrestrial receptors. Terrestrial receptors may include, but are not limited to invertebrates, white-tailed deer (herbivorous mammals), American robin (omnivorous birds), and the red-tailed hawk (carnivorous birds).
- Assessment of effects to on-Site aquatic receptors. Aquatic receptors may include, but are not limited to, benthic invertebrates, water-column invertebrates, fish, amphibians, raccoons (omnivorous mammals), great-blue heron, and mink.

It is also recommended that two future scenarios be evaluated: development and the status quo. This will provide the decision-makers with the best and most complete information on the environmental aspects of the property upon which to base a decision.

Specific Comments

Many of the changes to the SLERA that are necessary because of the General Comments were not included in the Specific Comments. An assessment of on-Site receptors in the SLERA will result in numerous changes that are not listed below. Note also that changes in Sections 2 to 9 should also be reflected in the Executive Summary.

1. **Page 2; Bullet 1:** Remove or modify the description of the habitat as *“unremarkable”* because it is ambivalent does not have direct relevance to the evaluation of potential ecological risk (the fact that no “sensitive habitats” are present is directly relevant) and it implies that only distinctive habitats qualify for Ecological Risk Assessment, which is not correct.
2. **Page 3; Paragraph 1:** Remove or modify the following statement, *“Due to marked physical disruption and resultant degradation of habitat on-Site, it does not support wildlife populations, communities and ecosystems.”* See the General Comments. The habitat on-Site supports wildlife populations, communities and ecosystems.
3. **Page 3; Paragraph 2:** Remove or modify the following statement, *“Thus, the available data indicate that Site-related ecological impacts (if any) in the off-Site and Western and Eastern Drainage Areas are spatially limited.”* The statement as written cannot be supported because of the small number of samples (no more than four) sampled within each area designated in Table 4-3.
4. **Page 3; Paragraph 3:** Remove or modify the following statement, *“Therefore, additional information may be necessary to determine what, if any, further evaluation of Off-Site surface water and sediment is warranted for protection of valuable ecological resources.”* This is not a suitable Scientific Management Decision Point. See Comment #49.
5. **Page 3; Paragraph 4:** Remove or modify this paragraph. A correctly accomplished SLERA, which this is not, is a *reasonable* worst-case scenario with attended uncertainties and conservative assumptions. It typically overpredicts exposure, but it could also underpredict exposure.
6. **Page 11; Paragraph 1:** Remove or modify the following statement, *“Therefore, this SLERA is based on the City’s and owner’s mutual intention that future land use at the Site will remain commercial/industrial.”* A SLERA should be conducted to estimate the likelihood that a particular ecological risk exists. A SLERA should not be performed under only a future land-use scenario and without evaluating the current ecological risks.
7. **Page 11; Bullet 4:** Remove the statement concerning the level of impact to the Northern Area. The level of impact to this area has not yet been established in the document.
8. **Page 12; Paragraph 3:** Please note that even though physical stressors may be present on- Site, the contribution from chemical stressors must be fully understood. If, for example, natural events were to alter habitat, the potential for inhibition of vegetative regeneration must be understood. Likewise, the potential for chemical stressors to increase susceptibility to disease should also be understood.
9. **Page 13; Paragraph 2:** Remove or modify the overall goal of the SLERA (*“ensure that COPECs associated with former Site operations do not adversely impact water quality and habitat conditions in off-Site drainage areas”*) because this has not yet been established in the document with a problem formulation or the selection of assessment endpoints. A general goal, such as preservation of ecological integrity or that stated in the Introduction (*“...evaluate whether potential exists for unacceptable risk relative to valuable ecological resources”*) would be more appropriate at this point in the document because it does not preclude the problem formulation and the selection of assessment endpoints.

10. **Page 15; Paragraph 1:** Change *"as wells"* to *"as well"*.
11. **Page 15; Bullet 1:** Remove or modify the description of the habitat as *"unremarkable."* See Comment #1.
12. **Page 16; Paragraph 1:** Remove the comment that terrestrial species observed during the Site visit all have access to superior habitat in the area. Superior habitat off-Site is not relevant to the evaluation of on-Site habitat.
13. **Page 16; Paragraph 1:** The unknown cause of the tree die-off is another reason to evaluate on-site terrestrial resources because it may be the result of on-site activities.
14. **Page 16; Paragraph 4:** Remove this paragraph. See the General Comments above concerning what wildlife the site could support and the value of this wildlife. Furthermore, common species are not precluded from risk evaluation. In fact, common species are frequently evaluated, often because exposure parameters and toxicology information is readily available.
15. **Page 17; Paragraph 3:** Remove or modify the following statement, *"None of the on-Site drainage features are of sufficient size or quality to support valuable ecological resources. However, the off-Site Western and Eastern Drainage Areas are further evaluated in this SLERA."* See General Comments above and note that it directly contradicts the statement in **Paragraph 2**, *"In July, basking turtles were observed in the east end of the pond, as well as dragonflies and frogs"* and the statement on **Page 19; Paragraph 3**, *"Wildlife observations included whitetail deer tracks, raccoon tracks, turtle burrows, frogs, crayfish holes and an eastern box turtle in a creek burrow."*
16. **Page 19; Paragraph 3:** Include reference or calculations for estimate of 20-fold dilution potential from confluence of tributary to Middle Fork Shoal Creek.
17. **Page 19; Paragraph 2.** Change or remove the following statement, *"The source of the precipitate is unknown, but the fact that it had been observed upstream of the Site on prior occasions suggests that there may be upstream sources or causes of the observed precipitation."* At the March 2004 Site visit, discoloration was observed to intensify where on-site residue piles were eroding into the drainage.
18. **Page 21; Paragraph 1.** Change or remove the following statement, *"As the off-Site soil samples collected by IEPA in 1993 were well-distributed around the Site, the available data do not indicate that off-Site migration of COPECs through wind deposition has occurred."* This statement cannot be supported because 1) only 14 off-site soil samples were collected by IEPA in 1993 (two of the 16 samples, X104 and X110, collected by IEPA in 1993 were actually collected inside the site boundaries. were sampled and 2) many of the samples collected by IEPA were located upwind (south) of the residue piles. As noted on **Page 21; Paragraph 1**, the prevailing wind direction from the site is from the south and southwest.
19. **Page 22; Paragraph 1:** Change or remove the following statement, *"However, NPDES sampling at the surface water outfalls conducted prior to permit cancellation in May 2003 demonstrated that current conditions on the Site would not result in off-Site impacts."* The sentence as written cannot be supported. According to the March 2002 Preliminary Site

Evaluation Report, chromium, copper, and zinc exceeded Illinois General Water Quality Standards (35 IAC 302 Subpart B) at Outfall 002.

20. **Page 22; Paragraph 2:** Change or remove the following statement, *"The fact that no dissolved metals were detected above applicable groundwater screening levels..."* Dissolved manganese concentrations were detected on-Site at G-102 above the screening level.
21. **Page 22; Paragraph 2:** Change or remove the following statement, *"Based on the limited off-Site extent of groundwater impacted by dissolved metals concentrations to the southwest of the Site, it is similarly concluded that groundwater discharge is not a significant pathway for the off-Site transport of COPECs to the southwest."* Only three wells were monitored off-Site in the Western Drainage way and all had dissolved manganese concentrations that exceeded screening levels.
22. **Page 22; Paragraph 3:** Change the following statement, *"Groundwater discharge to surface water similarly does not appear to be a complete pathway for off-Site transport of COPECs in either the Eastern or Western Drainage Areas"* to *"Groundwater discharge to surface water similarly does not appear to be a significant pathway for off-Site transport of COPECs in either the Eastern or Western Drainage Areas."*
23. **Page 23; Paragraph 1:** Remove the comment that terrestrial species observed during the Site visit all have access to superior habitat in the area. See Comment #12.
24. **Page 23; Paragraph 4:** Remove or modify the following statement, *"Of these eight ecological entities, the only one potentially relevant to the Site is off-site aquatic communities in the Eastern and western Drainage Areas."* Aquatic communities, native species and their habitats, and wetlands are present on-Site.
25. **Page 24; Paragraph 1:** Change or remove the following statement *"On these bases, evaluation of potential chemical to on-Site aquatic and terrestrial resources was not considered to be an appropriate objective for the SLERA."* This is disputed in the General Comments above. On-Site resources should be evaluated.
26. **Page 24; Paragraph 1:** List the specific provisions in the guidance (USEPA 1997) used to determine that relevant and/or significant are not present on-Site. These provisions could not be identified.
27. **Page 24; Paragraph 2:** Appendix D. Change or remove the following statement and referenced Appendix, *"A similar approach has been taken at other sites in EPA Region 5 (Appendix D)."* Site-specific decisions made at other sites should not set precedence for those made in a different SLERA.
28. **Page 24, Paragraph 5:** Because VOCs were detected on-site they should be considered COPECs and compared to screening guidelines.
29. **Page 25, Bulleted list of COPECs:** Add manganese and the VOCs to the list.
30. **Page 27; Paragraph 2:** Change *"While of mink"* to *"While mink"*.
31. **Page 27; Paragraph 3:** Change or remove the following statement, *"...these organisms represent species that are likely to receive the highest exposure to COPECs."* The SLERA exposure estimates for these organisms are the highest for only those organisms with the

- same exposure routes (piscivores). Other species with different exposure routes may receive higher exposures. This stipulation should be noted to prevent confusion.
32. **Page 28; Paragraph 2:** Recommendation is to include benchmarks for COPECs from additional sources if there is no applicable National or Illinois WQC. Specifically, the Secondary Chronic Values (SCVs) from Suter and Tsao (1996) are recommended. COPECs that are not evaluated in the SLERA because benchmarks were not available are carried forward to the BERA.
 33. **Page 28; Equation:** Include reference or supporting information to indicate if the equation is the regulatory promulgated equation to calculate hardness for Illinois WQC.
 34. **Page 29; Paragraph 3:** Appendix E. Recommendation is to include wildlife benchmarks from additional sources if there is no benchmark available in Sample et al. (1996). COPECs that are not evaluated in the SLERA because benchmarks were not available are carried forward to the BERA.
 35. **Page 31; Paragraph 2:** Table 4-3. Recommendation is to re-name the "off-Site Background" areas to prevent confusion with those background areas identified in Section 4.1.2.3. The off-site Background locations have not been shown to have concentrations unrelated to off-Site releases. In the Western Drainageway, the WD-11 location is approximate, and the WD-10 location may be impacted by erosion of on-Site residue piles. In the Eastern Drainageway, the ED-11 location is only approximately 100 feet north of the Site boundaries.
 36. **Page 31; Paragraph 3:** Please provide a description of the East off-Site farfield (Lake Hillsboro) sample data. These data are used to interpret trends in the SLERA, but no information is provided to determine their usability, such as sample locations in the Lake, conditions during the sampling events, sampling methodology, and detection limits.
 37. **Page 33; Section 7.1:** Add comparisons of sediment data to classification levels presented in IEPA's *Evaluation of Illinois Sieved Stream Sediment Data; 1982-1995* (1997).
 38. **Page 34; Section 7.1.1:** Include a summary of the exceedances for manganese that are missing from Table 7-1 because other exceedances are also described. See comments for Table 7-1 and Appendix G below.
 39. **Page 34; Paragraph 2:** Change or remove the following statement, "A slightly elevated HQ for aluminum was observed in farfield sediment, but not in surface water, and in neither medium at the nearfield and background locations." See comments for Table 7-1 and Appendix G below. The calculations to support this statement are incorrect.
 40. **Page 34; Paragraph 2:** Change or remove the following statement, "The zinc HQ for sediment was also greater than 1 at the background west location (the only exceedance observed in either medium there)." An exceedance was observed in surface water but the detection limit was too high. See comments for Table 7-1 and Appendix G below.
 41. **Page 34; Paragraph 6:** Change or remove the following statement, "Copper, lead, and manganese HQs were all slightly elevated in nearfield sediment, but not surface water, while the HQ for nickel was slightly elevated in nearfield surface water but not sediment. These low

exceedances in one medium..." The nickel HQ in sediment at this location exceeded one. See comments for Table 7-2 and Appendix G below.

42. **Page 36; Paragraph 1:** Change or remove the following statement, *"The fact that similar exceedances for aluminum were observed in both background and nearfield suggest that the presence of this metal is not Site-related."* The off-Site background location should not be considered as having concentrations unrelated to on-Site concentrations, or vice versa, because it is only approximately 100 feet off-Site. See SLERA Comment #21.
43. **Page 36; Paragraph 1:** Change or remove the following statement, *"No exceedances were observed at the farfield location...."* Exceedances were observed for aluminum, cadmium, selenium, and zinc based on non-detects.
44. **Page 36, Section 7.3:** Summarize those COPECs that were not evaluated because benchmarks could not be located. These COPECs should be evaluated further. COPECs that not evaluated are automatically carried forward as COPECs to the Baseline Risk Assessment.
45. **Page 36; Paragraph 2:** Change the following the statement, *"For this SLERA, a few inorganic analytes were detected at maximum concentrations that are associated with HQs greater than 1."* To *"For this SLERA, eight inorganic analytes were detected at maximum concentrations that are associated with HQs greater than 1."*
46. **Page 36; Paragraph 3:** Change or remove the following statement, *"HQs for lead and copper were elevated in sediment but not surface water, suggesting that these metals may not be bioavailable."* Because hazard quotients for exposures based on ingestion of sediment-dwelling biota were not calculated, this statement can not be supported. Recommendation is to include a ROC that captures this exposure pathway.
47. **Page 37; Paragraph 2:** Change or remove the following statement, *"In summary, the results of the SLERA indicate that the potential for adverse impacts to ecological receptors in both Western and Eastern Drainage Areas, if any, would likely be associated with the presence of zinc and cadmium in surface water and sediment, and is of limited spatial extent."* As stated in the SLERA (Section 7.0 and Table 7-5), there is no clear guidance to interpret the level of risk for COPECs with HQs that exceed one in a SLERA. Because exceedances were observed for several inorganics, all could be associated with adverse impacts. Similarly, the spatial extent should also not be determined using the magnitude of exceedance, as exceedances were also observed in farfield locations.
48. **Page 38; Paragraph 1:** Change or remove the following statement, *"The results of this SLERA indicate that elevated HQs for selected ROCs in the nearfield Western and Eastern Drainage Areas are related to locally elevated levels of zinc and cadmium in surface water and sediment."* The local area was not defined, but, if the intention was to describe elevated levels as only in the nearfield, this statement is not correct because exceedances were also observed in the farfield. Furthermore, HQs were also elevated for eight COPECs in the nearfield and/or farfield.
49. **Page 38; Paragraph 1:** There are only two possible decisions at this point for the Eagle Zinc Site:

- 1) The information is not adequate to make a decision at this point, and the ecological risk assessment process will continue to Step 3; or
- 2) The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted.

The statement that “*Additional information may be necessary to determine what if any further evaluation of Off-Site surface water and sediment is warranted for protection of valuable ecological resources*” (emphasis added) is not an adequate Scientific Management Decision Point.

50. **Table 7-1: Aluminum/Surface Water/Background West** - Change null value to 2.
51. **Table 7-1: Iron/Surface Water/Background West** - Change null value to 1.
52. **Table 7-1: Cadmium/Surface Water/Nearfield** - Change from 12 to 8 (and Figure 7-2).
53. **Table 7-1: Zinc/Surface Water/Nearfield** - Change from 457 to 292 (and Figure 7-1).
54. **Table 7-1: Add a row for Manganese and insert a value of 1 for Manganese/Sediment/Background West.**
55. **Table 7-2: Remove column for Sediment/Farfield to prevent confusion.** These data were not available.
56. **Table 7-2: Nickel/Sediment/Nearfield** - Change null value to 1.
57. **Table 7-3: Cadmium/Great Blue Heron/Farfield** - Change null value to 1.
58. **Figure 4-6: Modify Secondary Transport Mechanism for On-Site Surface Water to Off-Site Fish/Shellfish.** It is unclear how “Biotransfer” transports contaminants from on-Site surface water to off-Site fish/shellfish.
59. **Figure 7-4: Add bar to Great Blue Heron/Farfield/1.** See changes to Table 7-3.
60. **Appendix E. Toxicological Benchmarks for Wildlife: Chromium/Mink** - Change from null value to 4.497 for Cr VI (the Cr VI benchmark was used for aquatic life).
61. **Appendix E. Chronic Surface Water Criteria for Aquatic Life: Silver/Section 302:208 g Criteria (and criteria for ERA comparison)** - Change from 1 to 5.
62. **Appendix E. Chronic Surface Water Criteria for Aquatic Life: Aluminum/CCC (and criteria for ERA comparison)** - Change from blank to 0.87.
63. **Appendix E. Toxicological Benchmarks for Wildlife: Selenium/Mink** - Change from 1 to 4.318E-04.
64. **Appendix G. Hazard quotients for aquatic life based on surface water exposures:** Adjust the number of significant digits, particularly where “0.00” is listed.
65. **Appendix G. Hazard quotients for aquatic life based on surface water exposures:** Indicate in footnotes what blank cells represent (not sampled or no value available).
66. **Appendix G. Hazard quotients for aquatic life based on surface water exposures:** Recalculate hardness-dependent screening values for East off-Site nearfield and East off-Site farfield (screening values are listed as the same although the hardnesses differ).

67. **Appendix G. Hazard quotients for aquatic life based on surface water exposures:** Recalculate hardness-dependent screening values in the West off-Site nearfield (errors were noted).
68. **Appendix G. Hazard quotients for piscivores based on surface water exposures:** Adjust the number of significant digits, particularly where "0.00" is listed.
69. **Appendix G. Hazard quotients for piscivores based on surface water exposures:** Remove screening value and HQs for iron.
70. **Appendix G. Hazard quotients for aquatic life based on sediment exposures:** Recommendation is to shade all hazard quotients that are greater than one, or indicate in the footnotes that only those that are greater than LELs were shaded to prevent confusion.
71. **Appendix G. Hazard quotients for aquatic life based on sediment exposures:** Add shading to Chromium LEL HQ in West-Background Tributary to South of Site.
72. **Appendix G. Hazard quotients for aquatic life based on sediment exposures:** Add shading to Manganese LEL HQ in West-Background Tributary to West of Site.
73. **Appendix G. Hazard quotients for aquatic life based on sediment exposures:** Recalculate all nickel HQs (except the ERL HQ, which was correct) and add appropriate shading in West Off-Site Nearfield (errors were noted).
74. **Appendix G. Hazard quotients for aquatic life based on sediment exposures:** Recalculate ERL, ERM, TEL, and PEL HQs for zinc in East-Background (errors were noted).
75. **Appendix G. Hazard quotients for aquatic life based on sediment exposures:** Add shading to arsenic and nickel LEL HQs in East-Off-Site Nearfield.